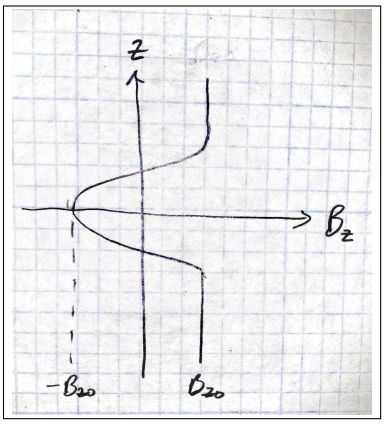

Figure 1: *Sketch* of the stratification profile for problem 6.

6: An unstable layer in an inviscid fluid

Knowing that $\mathrm{sech}^2(0) = 1$ and $\mathrm{sech}^2(\pm\infty) = 0$, we can tell that B_z goes to B_{z0} far from $z = 0$ and $-B_{z0}$ at $z = 0$ (figure 1). In a layer surrounding $z = 0$ (specifically $-0.88 < z < 0.88$), B_z is negative.

We seek a solution of (2.29) for the special case $\tilde{k} = \alpha$:

$$\sigma^2\Big(\frac{\mathrm{d}^2}{\mathrm{d}z^2} - \alpha^2\Big)\hat{w} = B_z\alpha^2\hat{w}.$$

Try the suggested function $\hat{w} = \mathrm{sech}^2\beta z$, and seek a value of β for which the equation is satisfied. Guessing $\beta = \alpha$, we find that the equation is satisfied and the growth rate is

$$\sigma = \sqrt{B_{z0}/3}.$$